

REMARKS

By this Amendment, claims 44, 47, 49-51, 53, 55 and 57 are amended, and claims 43 and 48 are canceled, without prejudice to or disclaimer of the subject matter found therein. Support for these features may be found at least at page 15, lines 7-10 of the present specification. No new matter is added. Claims 6-32 and 40-57 are pending in this application. Claims 9-13 are withdrawn from consideration. Reconsideration of the application is respectfully requested.

Applicants appreciate the courtesies shown to Applicants' representatives by Examiner Nguyen in the November 22, 2005 personal interview. Applicants' separate record of the substance of the interview is incorporated into the following remarks.

Entry of the amendments is proper under 37 CFR §1.116 since the amendments: (a) place the application in condition for allowance for the reasons discussed herein; (b) do not raise any new issue requiring further search and/or consideration as the amendments amplify issues previously discussed throughout prosecution; (c) do not present any additional claims without canceling a corresponding number of finally rejected claims; and (d) place the application in better form for appeal, should an appeal be necessary. The amendments are necessary and were not earlier presented because they are made in response to the new grounds of rejection. Entry of the amendments is thus respectfully requested.

I. Allowable Subject Matter

Applicants gratefully acknowledge that the Office Action indicates that claims 6-8, 14-32 and 40-42 are allowed.

II. Rejections Under 35 U.S.C. §§102(b) and 103(a)

The Office Action rejects claims 43-48, 51 and 55-57 under 35 U.S.C. §102(b) over U.S. Patent No. 5,103,457 to Wallace et al. (Wallace); rejects claims 49-50 and 52 under 35 U.S.C. §103(a) over Wallace in view of U.S. Patent No. 6,347,109 to Beach et al. (Beach);

and rejects claims 53 and 54 under 35 U.S.C. §103(a) over Wallace in view of admitted prior art.

The rejection is moot with respect to canceled claims 43 and 48. However, claim 49 is written in independent form to incorporate all features of canceled claims 43 and 48. Further, claims 44, 47, 50, 51, 53, 55 and 57 are amended to depend from claim 49. Therefore, Applicants respectfully traverse a rejection of claims 44-47 and 49-57 based on Wallace and Beach.

Wallace does not teach or suggest a diode-pumped laser in which "the laser medium is bonded to a heat sink on a bottom side," "the pump light beam is incident on a top side of the laser medium," and "the fundamental mode of the laser medium is operated transversely to a heat flow in the laser medium," as recited in independent claim 49.

As discussed during the personal interview, Wallace teaches, in Figs. 2 and 4, laser diodes 35, 104 that pump light in a non-symmetrically diverging elliptical beam 38, 108 that is focused and partially collimated through a lens means 40, 110 to form a pump light beam 41, 112. See col. 4, lines 40-44, and col. 6, lines 22-27. The pump light beam 41, 112 then penetrates a back-mirror 42, 114 provided on one side of a solid-state gain medium 34, 116 and emerges from an opposing surface 44, 124 of the solid-state gain medium 34, 116. See col. 4, lines 44-51, and col. 6, lines 28-44. Therefore, both the back-mirror 42, 114 and the opposing surface 44, 124 provided on the solid-state gain medium 34, 116 are used for optical purposes.

Wallace also teaches that solid-state lasing gain materials, e.g., the solid-state gain medium 34, 116 should be provided with a heat-sinking means. See col. 7, lines 45-48. Although Wallace teaches that an axis of the pump light beam 112 is oblique or vertical to a fundamental mode axis OA4, Wallace does not mention any specific placement or design of the heat-sinking means relative to the solid-state gain medium 34, 116. See Fig. 4. Further,

placement of a heat sink on an surface of the sold-state gain medium 34, 116 that is opposite to the back-mirror 42, 114 would be problematic in the device of Wallace because the opposing surface 44, 124 provided on the solid-state gain medium 34, 116 is used for optical purposes according to Wallace. Placing a heat sink on the opposing surface 44, 124 would interrupt/interfere with the beam used in the remainder of the optical system of Wallace.

The Office Action acknowledges that Wallace does not teach or suggest a diode-pumped laser in which "the pump light beam is incident on a top side of the laser medium," as recited in independent claim 49. However, the Office Action asserts that Beach remedies the deficiencies of Wallace. Specifically, the Office Action asserts that Beach teaches a pump light beam incident on a top side of a laser medium. Therefore, the Office Action asserts that it would have been obvious to a person of ordinary skill in the art to provide the device of Wallace with pump light incident on a top surface of a laser medium as taught by Beach to have an alternative way of pumping the gain medium. Applicant respectfully disagree with this assertion for the reasons discussed below.

As discussed during the personal interview, Beach teaches, in Fig. 2, a conventional thin disk laser including pump radiation 10 incident on a top surface of a thin disk laser sample 16 with perpendicular emission. Beach also teaches a reflective coating 20 that reflects the pump radiation 10 as an output beam 19 from the thin disk laser sample 16. See Fig. 2. However, the output beam 19 is reflected, from the thin disk laser sample 16, in a direction parallel to the heat flow. See Fig. 2. Therefore, contrary to the diode-pumped laser of claim 49, a fundamental mode of the thin disk laser sample 16 is not operated transversely to the heat flow in the thin disk laser sample 16.

Beach also teaches that the thin disk geometry ensures that the pump radiation 10 heat will flow in a substantially downward direction in the thin disk laser sample 16 to the cooling block 18 provided on an opposite side of the thin disk laser sample 16, so that no thermal

gradient results in a direction transverse to a laser axis. See col. 2, lines 15-18 and col. 3, lines 27-31. Because Beach explicitly teaches avoiding any heat flow transverse to a laser axis, Beach requires a parallel setup of the pump beam and the laser axis. A thin disc laser similar to Beach is also discussed as related art in the present application. See page 15, lines 5-10 of the present specification.

Applicants respectfully submit that it would not have been obvious to a person of ordinary skill in the art to combine Wallace's oblique orientation of the pump beam and laser axis shown in Fig. 4 with Beach's parallel orientation of the pump beam and laser axis, as alleged by the Examiner. Wallace teaches, in Fig. 4, an oblique orientation of the pump beam and laser axis so that the solid-state gain medium 116 lases light 118 which may emerge from the surface 124 at a certain angle B4. See col. 6, lines 39-60. However, as discussed above, Beach teaches away from using a setup in which any heat flow is transverse to a laser axis. Therefore, applying the parallel orientation of Beach to the Wallace's device shown in Fig. 4 would result in a fundamental mode that is parallel or vertical to a pump beam.

As discussed above, the device shown in Fig. 4 of Wallace requires an oblique orientation so that the solid-state gain medium lases the light 118 to emerge from the surface 124 at the angle B4. Applying Beach's parallel orientation to Wallace's oblique orientation would result in a fundamental mode that is parallel to a pump beam and heat flow. As such, the device shown in Fig. 4 of Wallace would not perform as intended, e.g., allowing the light 118 to emerge at a certain angle. Therefore, combining Beach's parallel orientation with Wallace's oblique orientation destroys the principal operation of Wallace.

Applying Beach's parallel orientation of the pump beam and laser to the devices shown in Figs. 2 and 3 of Wallace would also result in a fundamental mode that is parallel to a pump beam and heat flow. Because the device as shown in Figs. 2 and 3 of Wallace already teaches parallel orientation of the pump beam and laser, the Office Action's asserted

combination of the teachings of Beach with Figs. 2 and 3 of Wallace would not alter the existing structure of Figs. 2 and 3 of Wallace.

The diode-pumped laser of claim 49 is different from Wallace, Beach's thin disc laser and the related art discussed in the specification in that a laser mode of the claimed diode-pumped laser is operated transversely to heat flow rather than parallel to a vertical dimension. See page 15, lines 5-10 of the present specification.

In the diode-pumped laser of claim 49, a heat sink is bonded to a bottom side of a laser medium and a pump light beam is incident on an opposing side of the laser medium. For example, in exemplary Fig. 7 of the present application, a pump light beam 7 enters a top side of a laser medium 4 that is opposite to a side of the laser medium that is bonded to a heat sink 12. Also, a fundamental mode is oriented parallel to a surface of the heat sink 12 that is bonded to the laser medium 4. See, for example, Fig. 7. As a result, a laser mode optical axis 23 is transverse/perpendicular to heat flow K and a pump beam. See, for example, Fig. 7. Neither Wallace nor Beach, alone or in permissible combination, teaches or suggests these features as set forth in claim 49.

Applicants admitted prior art also does not remedy the deficiencies of Wallace and Beach discussed above.

Therefore, claim 49 would not have been rendered obvious by Wallace, Beach and admitted prior art, alone or in permissible combination. Claims 44-47 and 50-57 depend from, claim 49, and thus also would not have been rendered obvious by Wallace, Beach and admitted prior art, alone or in combination, for at least the reasons set forth above, as well as for the additional features they recite. Accordingly, reconsideration and withdrawal of the rejections are respectfully requested.

III. Conclusion

Claim 9-13 depend from and incorporate all features of allowed claims 40 and 8, and thus rejoinder of claims 9-13 is respectfully requested.

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 6-32 and 40-57 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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